

What is claimed is:

1 A system for balancing a distribution of allocations for protected software over a  
2 communication network according to a license policy, the system comprising:

3 at least one client computer coupled to the communication network for  
4 requesting authorizations to use the protected software; and

5 a pool of license servers coupled to the communication network, each license  
6 server programmed for managing a distribution of allocations to use the protected software;

7 the pool of license servers including a current leader server programmed for  
8 updating the distribution of allocations to add at least one additional allocation to a particular  
9 license server if that particular license server did not have a sufficient number of allocations.

10 2. A system as recited in claim 1, each license server further including a  
11 borrowing threshold and programmed for determining whether the particular license server did  
12 not have a sufficient number of allocations by dividing an allocations-in-use value for that  
13 particular license server by a total allocation value for that particular license server and  
14 determining if a quotient of the division is greater than the borrowing threshold.

15 3. A system as recited in claim 2, the current leader server further programmed for  
16 updating the distribution of allocations to add at least one additional allocation to a particular  
17 license server if that particular license server did not have a sufficient number of allocations at  
18 any time during processing of a request for authorization from a client computer.

19 4. A system as recited in claim 2, the current leader server further including  
20 memory for storing the distribution of allocations for all license servers in the pool.

1        5. A system as recited in claim 2, wherein if the particular license server  
2 determines that it does not have a sufficient number of allocations at any time during  
3 processing of a request for authorization received from the client computer, the current leader  
4 server is further programmed for:

5                looking for a source of available allocations by checking a count of available  
6 allocations in a free pool, any down license servers, and the leader server; and

7                decreasing the count of available allocations from the source of available  
8 allocations and increasing the count of available allocations for the particular license server if  
9 the source of available allocations is found.

1        6. A system as recited in claim 5, the current leader server further programmed for  
2 communicating the updated distribution of allocations in the pool to all functioning license  
3 servers in the pool that are not the current leader server through a distribution criteria sync  
4 message.

1        7. A system as recited in claim 4, the current leader server further programmed for  
2 storing a new distribution of allocations in response to a change distribution criteria message  
3 containing the new distribution of allocations communicated to a license server.

1        8. A system as recited in claim 7:

2                the license servers that are not the current leader server further programmed for  
3 communicating the change distribution criteria message to the current leader server if the  
4 license servers that are not the current leader server should receive a change distribution  
5 criteria message; and

6                the current leader server further programmed for communicating the new  
7 distribution of allocations in the pool to all functioning license servers in the pool that are not  
8 the leader server through a distribution criteria sync message.

1           9. A system as recited in claim 4, the current leader server further programmed for  
2 adding allocations to the pool in response to an add allocations message containing a count of  
3 allocations to be added to particular protected software communicated to a license server.

1           10. A system as recited in claim 9:  
2                   the license servers that are not the current leader server further programmed for  
3 communicating the add allocations message to the current leader server if the license servers  
4 that are not the current leader server should receive an add allocations message; and  
5                   the current leader server further programmed for communicating an updated  
6 distribution of allocations in the pool to all functioning license servers in the pool that are not  
7 the leader server through a distribution criteria sync message.

1           11. A system as recited in claim 4, the current leader server further programmed for  
2 adding a new license code to the pool in response to an add license code message containing a  
3 license code to be added communicated to a license server.

1           12. A system as recited in claim 11:  
2                   the license servers that are not the current leader server further programmed for  
3 communicating the add license code message to the current leader server if the license servers  
4 that are not the current leader server should receive an add license code message; and  
5                   the current leader server further programmed for communicating an updated  
6 distribution table containing the stored license codes and corresponding distribution of  
7 allocations in the pool to all functioning license servers in the pool that are not the leader  
8 server through a distribution criteria sync message.

1           13. A system as recited in claim 4, the current leader server further programmed for  
2 updating the distribution of allocations to add at least one additional allocation to a particular  
3 license server if that particular license server did not have a sufficient number of allocations at

4 any time during processing of an update message received from at least one client computer  
5 operating in fail-over mode.

1 14. A system as recited in claim 13, wherein if the particular license server  
2 determines that it does not have a sufficient number of allocations at any time during the  
3 processing of an update message received from at least one client computer operating in fail-  
4 over mode, the current leader server is further programmed for:

5 looking for a source of available allocations by checking a count of available  
6 allocations in the leader server, a free pool, and any down license servers; and

7 decreasing the count of available allocations from the source of available  
8 allocations and increasing the count of available allocations for the particular license server if  
9 the source of available allocations is found.

1 15. A system as recited in claim 14, wherein if no source of available allocations is  
2 found by checking the count of available allocations in the leader server, the free pool, and any  
3 down license servers, the current leader server is further programmed for:

4 looking for a source of available allocations by checking a count of available  
5 allocations in all functioning license servers not designated as the leader server; and

6 decreasing the count of available allocations from the source of available  
7 allocations and increasing the count of available allocations for the particular license server if  
8 the source of available allocations is found.

1 16. A method for balancing a distribution of allocations for protected software over  
2 a communication network, the method comprising the steps of:

3 coupling a pool of license servers to the communication network;

4 assigning a distribution of allocations to the pool;

5 coupling at least one client computer to the communication network; and

6 updating the distribution of allocations to add at least one additional allocation to  
7 a particular license server if that particular license server did not have a sufficient number of  
8 allocations in response to a request for authorization received from a client computer.

1        17. A method as recited in claim 16, the step of updating the distribution of  
2 allocations further including the steps of:  
3                assigning a borrowing threshold to each license server; and  
4                determining whether the particular license server did not have a sufficient  
5 number of allocations by dividing an allocations-in-use value for that particular license server  
6 by a total allocations value for that particular license server and determining if a quotient of the  
7 division is greater than the borrowing threshold.

1        18. A method as recited in claim 16, the step of updating the distribution of  
2 allocations further including the step of:  
3                selecting one of the license servers in the pool as a current leader server for  
4 storing the distribution of allocations for all license servers in the pool and for managing a re-  
5 assignment of allocations to give at least one additional allocation to a particular license server  
6 if that particular license server did not have a sufficient number of allocations at any time  
7 during processing of a request for authorization received from the client computer.

1        19. A method as recited in claim 18, wherein when it is determined that the  
2 particular license server did not have a sufficient number of allocations during the processing  
3 of a request for authorization received from the client computer, the method further includes  
4 the steps of:

5                looking for a source of available authorizations by checking a count of available  
6 authorizations in a free pool, any down license servers, and the current leader server; and  
7                decreasing the count of available allocations from the source of available  
8 allocations and increasing the count of available allocations for the particular license server if  
9 the source of available allocations is found.

1        20. A method as recited in claim 19, further including the step of:

2                   communicating the updated distribution of allocations in the pool to all  
3 functioning license servers in the pool that are not the current leader server through a  
4 distribution criteria sync message.

1           21. A method as recited in claim 18, further including the step of:  
2                updating the distribution of allocations by communicating a change distribution  
3 criteria message containing a new distribution of allocations to at least one license server.

1           22. A method as recited in claim 21, the step of updating the distribution of  
2 allocations by communicating a change distribution criteria message further including the steps  
3 of:

4                communicating the change distribution criteria message to the current leader  
5 server;

6                updating the distribution of allocations in the pool in the current leader server;  
7 and

8                communicating the updated distribution of allocations in the pool to all other  
9 functioning license servers in the pool that are not the current leader server through a  
10 distribution criteria sync message.

11           23. A method as recited in claim 18, further including the step of:  
12                adding allocations to the pool by communicating an add allocations message  
13 containing a count of allocations to be added to particular protected software to at least one  
14 license server.

15           24. A method as recited in claim 23, the step of adding allocations to the pool by  
16 communicating an add allocations message further including the steps of:  
17                communicating the add allocations message to the current leader server;  
18                updating the distribution of allocations in the pool in the current leader server;  
19 and

6                   communicating the updated distribution of allocations in the pool to all other  
7 functioning license servers in the pool that are not the current leader server through a  
8 distribution criteria sync message.

1           25. A method as recited in claim 18, further including the step of:  
2                   adding a new license code for protected software to the pool by communicating  
3 an add license code message containing a license code to be added to at least one license  
4 server.

1           26. A method as recited in claim 25, the step of adding a license code for protected  
2 software to the pool by communicating an add license code message further including the steps  
3 of:  
4                   communicating the add license code message to the current leader server;  
5                   updating a distribution table containing the stored license codes and  
6 corresponding distribution of allocations in the pool in the current leader server; and  
7                   communicating the updated distribution table to all other functioning license  
8 servers in the pool that are not the current leader server through a distribution criteria sync  
9 message.

1           27. A method as recited in claim 18, further including the steps of:  
2                   updating the distribution of allocations to add at least one additional allocation to  
3 a particular license server if that particular license server did not have a sufficient number of  
4 allocations during the processing of an update message received from at least one client  
5 computer operating in fail-over mode.

1        28. A method as recited in claim 27, wherein when it is determined that the  
2 particular license server did not have a sufficient number of allocations during the processing  
3 of an update message received from at least one client computer operating in fail-over mode,  
4 the method further includes the steps of:

5                looking for a source of available allocations by checking a count of available  
6 allocations in the current leader server, a free pool, and any down license servers; and  
7                decreasing the count of available allocations from the source of available  
8 allocations and increasing the count of available allocations for the particular license server if  
9 the source of available allocations is found.

1        29. A method as recited in claim 28, wherein if no source of available allocations is  
2 found by checking the count of available allocations in the current leader server, the free pool,  
3 and any down license servers, the method further includes the steps of:

4                looking for a source of available allocations by checking a count of available  
5 allocations in all functioning license servers not designated as the current leader server; and  
6                decreasing the count of available allocations from the source of available  
7 allocations and increasing the count of available allocations for the particular license server if  
8 the source of available allocations is found.

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